NOVA

Original broadcast: November 14, 2006 PBS

Family That Walks on All Fours

PROGRAM OVERVIEW

Note: As this program contains graphic information about physically and mentally handicapped individuals, it is best suited for mature 11th- and 12th-grade students. Be aware that issues about culture and physical handicaps may arise for some students viewing the program. Please preview it to determine its appropriateness for your classroom.

NOVA takes a look at possible reasons why some members of a Turkish family walk on all four limbs.

The program:

- introduces the scientist who discovered the family and details his belief that the handwalkers represent an instance in which ancient genes have resurfaced.
- presents fossil findings that indicate early human ancestors had a wrist structure that enabled knucklewalking on the ground like chimpanzees or gorillas, not palmwalking like the handwalkers.
- reports the view of most experts who believe that while genes may malfunction to create, for example, short tails or excess facial hair in humans, ancient genes do not resurface in living organisms.
- details research involving mutant fruit flies that reveal that animals share common forms because their bodies are all built from the same set of master genes.
- follows a team of German scientists who are searching for one or more genes that relate to bipedality.
- examines what might be discovered about human origins by studying mutations in living people.
- reports on the discovery of a gene that seems to be related to an increase in brain size and may have been involved in the evolution of brain expansion.
- notes that many scientists do not believe that a complex physical trait like walking or brain size can be traced to a single gene mutation.
- considers how environmental factors may have played a role in how some of the family's members came to walk on all fours.
- reviews the isolation and challenges that the family faces because of the disabilities of some of its members.

Taping Rights: Can be used up to one year after program is recorded off the air.

BEFORE WATCHING

1 Have students recall people they know or have read or heard about who have coped with physical challenges. What strengths and attributes did these people have that allowed them to successfully cope with their disabilities?

2 As students watch, assign groups to collect information on different themes presented in the program. Students will use these notes to complete the "Handwalkers Raise Questions" activity. See the activity procedure section on page 2 for a list of suggested themes.

AFTER WATCHING

1 Ask students to identify some of the issues that surfaced in the program. *(Issues raised included friction between the scientists and some of the Turkish people due to Islam's disbelief in evolution, the family's limited access to medical care, the family's being ostracized by other villagers, and the effect the scientists' visit had on the family.)* How did each of these issues impact how the family lived?

2 Just as medical doctors must adhere to the Hippocratic Oath, scientists worldwide must follow guidelines for professional conduct. Have students research ethical guidelines in fields that deal with human subjects, such as biomedicine, nutrition, and anthropology. Create a list of disciplines and assign each group to research and report on one of them. What are some of the common themes that emerge across all areas of scientific study?

CLASSROOM ACTIVITY

Activity Summary

Students use a viewing guide while watching a program about members of a Turkish family who walk on four limbs and discuss program themes after watching.

Materials for Each Team

- copy of the "Handwalkers Raise Questions" student handout

Background

In early 2005, scientists discovered five of 11 siblings in a Kurdish family living in southern Turkey who walked on all fours. Uner Tan, the Turkish scientist who first reported the discovery, believed that studying the family could shed light on evolution. He suggested the family members were a "throwback" to a much earlier time in human prehistory. Many scientists disagreed with his conclusions.

A team of German scientists thinks there may be one or a few genes responsible for bipedality. Most scientists believe that a complex trait like walking upright is a consequence of changes to many genes over a long period of time.

Some scientists believe that brain damage caused by a genetic mutation may have influenced how the family members walk (all five siblings are mentally handicapped). Some scientists also think that environmental influences played a role, including the idea that the siblings may never have made the transition from an infant "bear crawl" they used to move around.

In this activity, students will track four themes within the program and prepare a presentation sheet on each assigned theme and consider some of the ethical issues of studying and filming this family.

LEARNING OBJECTIVES

Students will be able to:

- understand that scientists sometimes propose different theories for the same condition.
- discuss some of the ethical issues related to studying this family.

STANDARDS CONNECTION

The "Handwalkers Raise Questions" activity aligns with the following National Science Education Standards (see books.nap.edu/html/nses).

GRADES 9–12
Science Standard C
Life Science
- Biological evolution

Video is required for this activity.

Classroom Activity Author
Developed by WGBH Educational Outreach staff.

CLASSROOM ACTIVITY (CONT.)

Procedure

1. Organize students into four teams. Assign each team one of the following themes to take notes on as they watch the program:
   - Possible reasons for why some family members are handwalkers.
   - Treatment of the family by outsiders (e.g., villagers, scientists, and film producers).
   - Neurological tests that were performed and the conclusions drawn.
   - Interactions among family members and the beliefs they hold.
2. Distribute a copy of the student handout to each team before viewing. Discuss appropriate background information with students, and explain that sensitive issues related to culture and physical challenges faced by the family are addressed in the program.
3. Show the program and have students individually take notes on the theme their team has been assigned.
4. After watching the program, have students meet in their teams to discuss their notes. Have each team prepare a presentation sheet that includes information and ideas from each team member.
5. Have teams share their presentation sheet and any questions that came out of their teamwork. (See Activity Answer on page 4 for possible theme presentation material. Accept all reasonable answers.) Ask students in the rest of the class if they agree with what the team has presented. If students don't agree, ask them to explain why and provide evidence from the program that will support their opinions. Based on the evidence presented in the program, which of the hypotheses presented do students think best explains the siblings' condition? Why?
6. To conclude, discuss some of the ethical issues related to studying and filming a family with challenges such as those of the family in the program. Assign each team one or two ethical issues to explore. Ask students to include in their discussion how studying this family may be helpful to scientists and others, and how it could be both helpful and hurtful to the family. Have teams share what they discussed.
7. As an extension, have students research and present information on Turkey and Turkish culture.

ACTIVITY ANSWER

Suggested points related to themes listed on the student handout:

Possible reasons for why some family members are handwalkers.

- One scientists thinks the family members are "throwbacks" exhibiting traits that have resurfaced after being absent for generations.
- Most scientists do not believe that ancient genes resurface in living organisms.
- A team of German scientists believe there may be a gene or small set of genes for bipedality. Many scientists believe bipedality cannot be traced to a single gene, thinking that evolution usually proceeds more gradually and involves many mutations.
- Some scientists think that brain damage may contribute to the five siblings' inability to walk on two legs, although others with this sort of damage have been known to walk on two legs.
- Some scientists think that environmental factors played a large role in how the family members walk.

Treatment of the family by outsiders.

- Family members experienced isolation and ridicule from members of their community. Children threw rocks at family members, who were outcasts because of their challenges. After they rebuilt their house and ran out of water, they received no assistance from the community.
- The visiting scientists and film crew placed a spotlight on the family, perhaps adding to the local tension.
- The crew and scientists working on the film brought the family walkers and parallel bars, arranged for them to work with a physical therapist, and took them to the beach.

Neurological tests that were performed and the conclusions drawn.

- The neurologist gave family members simple tasks to complete. A discrepancy arose between how well the siblings performed in front of the neurologist and the skills they exhibited in private. For example, Safiye didn't perform well using a pegboard, but later she was observed tying her scarf.
- MRIs were used to study family members' brains. It was discovered that Huseyin, Hacer, and Safiye each had a shrunken area in the middle of the cerebellum. However, the presence of a small cerebellum may not be enough to explain why these siblings walk on all fours, as other people with a similar condition can walk upright.

Interactions among family members and the beliefs they hold.

- Family members cared for and supported each other.
- The family believed God was testing them, and that they would be rewarded after death for doing God's deeds in life.
- The family is Muslim and does not believe in evolution. The father felt being compared to other species was degrading to his family.

LINKS AND BOOKS

Links

NOVA—Family That Walks on All Fours
www.pbs.org/nova/allfours
Find articles, interviews, interactive activities, and resources in this companion Web site to the program.

Cerebellum
www.sci.uidaho.edu/med532/cerebell.htm
Explains the cerebellum's role in walking.

Laboratory of Neuroimaging
www.loni.ucla.edu/About_Loni/education/AB_Cerebellum.shtml
Describes the function of the cerebellum.

Turkish Culture Foundation
www.turkishculture.org
Provides information on many aspects of Turkish culture.

Books

The Brain Explained
by Daniel Drubach.
Prentice Hall, 2000.
Describes the structure and function of different parts of the brain and disorders that can affect the brain.

Turkey
by Chris Eboch.
Lucent Books, 2003.
Includes information on the geography of Turkey and Turkish culture.

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NOVA

Handwalkers Raise Questions

The discovery of some Turkish family members who walk on four limbs sparked an intense debate among scientists as to why this occurred. In this activity, learn more about this family and the perspectives of different scientists.

Procedure

1. Circle your assigned theme listed at right. Write your theme at the top of a piece of lined paper. Be sure to ask for clarification if you do not understand what your theme means. As you watch the program, take notes on the theme you have been assigned.
2. After watching the program, meet with your team members. Come up with a presentation sheet that includes theme-related information from the program.
3. As a team, share your theme presentation with the class.

Themes

Take notes on your theme on a separate sheet of paper.

- Possible reasons for why some family members are handwalkers.
- Treatment of the family by outsiders (e.g., villagers, scientists, and film producers).
- Neurological tests that were performed and the conclusions drawn.
- Interactions among family members and the beliefs they hold.

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